LETTERS TO THE EDITOR

Prompt publication of brief reports of important discoveries in physics may be secured by addressing them to this department. Closing dates for this department are, for the first issue of the month, the twentieth of the preceding month; for the second issue, the fifth of the month. The Board of Editors does not hold itself responsible for the opinions expressed by the correspondents.

A Note on the Band Spectrum of Silicon Fluoride

A few years ago Johnson and Jenkins[1] examined the spectrum of a discharge in silicon fluoride gas and found evidence of several band systems. One of these they examined in some detail and attempted a rotational analysis of what is apparently the (0,0) band at λ4368. They found a very large moment of inertia for the emitter which led them to very improbable conclusions as to its structure and nature.

We recently had occasion to examine the data of Johnson and Jenkins and noticed some peculiarities which suggested a possible error in their analysis. Among other things there is an indication of an alternation of intensity in the lines in one region of the λ4368 band and also considerable irregularity in the spacing which suggests that the lines do not all belong to the same band.

We have consequently reexamined under very high dispersion the violet portion of the spectrum obtained in the silicon fluoride discharge and have found some interesting features not previously noted. There are apparently two systems in the region with considerable overlapping of bands from the two. The superposition of two bands at λ4368 is so perfect that it does indeed give the impression at first that all the lines belong to one band. On closer examination one observes two band heads, very close together, which the previous workers apparently did not resolve, and quite strikingly the alternation of intensity and irregularity of spacing which were merely indicated by their data. There is very little doubt that only every other line belongs to one band and the remainder to a second, as there are several bands in the region where overlapping does not occur and which show twice the line spacing of the λ4368 structure. Wherever two bands do practically coincide violent perturbations are observed in some portion of them.

Since Johnson and Jenkins calculated the rotational constants on the assumption that all the lines in the λ4368 structure belonged to one band it is evident that they obtained moments of inertia about twice too large. If one takes half these values and calculates the internuclear distances on the assumption that the emitter is the SiF molecule, one obtains very reasonable results.

A further study of the spectrum is in progress and details will appear shortly.

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April 29, 1935.

[1] R. C. Johnson and H. G. Jenkins, Proc. Roy. Soc. **A116**, 327 (1927).

Scattering of Neutrons

In view of the recent measurements of Dunning, Pegram, Fink and Mitchell[1] on the absorption of fast and slow neutrons by various metals and of the rather large absorption cross sections shown by some metals for slow neutrons, we have made a preliminary investigation of the scattering of neutrons by several substances.

A bulb S containing radon (240 millicuries to 80 millicuries) and beryllium was placed in a cylinder of paraffin as shown in Fig. 1. After passing through 6 cm of paraffin, the neutrons from the source struck a silver foil, 6×10 cm, and then were scattered from blocks of metal the same size as the silver foil, placed above it. The scattering was measured by observing the increase in the radioactivity of the silver foil caused by the presence of various thicknesses of scatterer.

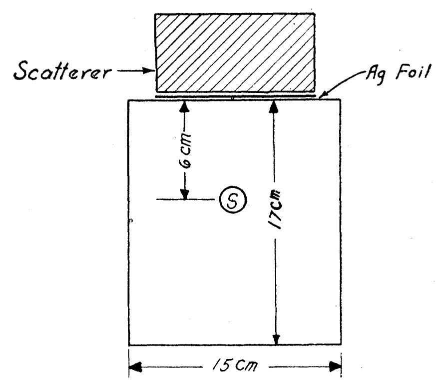

Fig. 1. Arrangement of scattering metal, silver foil and paraffin block containing the neutron source S.

The radioactivity induced in the silver by neutrons was first measured with no scatterer present. This was accomplished by placing the foil in the position as shown and irradiating it for 6 minutes. The sample was then removed and wrapped around a Geiger-Müller tube counter having thin aluminum walls. Counting was begun one minute after removing the sample and was continued until the end of the fifth minute, readings being taken every half minute. The activity of the foil was then given by the total count in this interval minus the natural count of the Geiger-Müller tube. A similar procedure was carried out when the scatterer was placed above the foil as shown in the diagram. The percentage increase in the activity of the silver sample (i.e., activity of the silver with scatterer present minus activity of silver alone, divided by the activity of the silver alone) was plotted as a function of the thickness of the scatterer. On the average about 1000